Claims

1. Bearing module for a motor vehicle steering gear having a rack (9) and a driving pinion (10) in mesh therewith, wherein the bearing module has at least one pressure member (3; 13, 30) with a receiving concavity, whose concave wall surrounds a guide passage (14) for the axial guiding of the rack (9), and radial forces emitted from the wall may be generated by means of at least one translationally displaceable wedge device (3c, 13c; 30a, 31a) for pressing the rack (9) received in the guide passage (14) on to the driving pinion (10) engaging therein, characterised in that in order to generate the radial forces, the one or more wedge devices (3c, 13c; 30a, 31a) are guided displaceably in a direction (4) which extends axially or axially parallel to the guide passage (14) for the rack (9).

2. Bearing module according to claim 1, characterised in that the one or more wedge devices (3c, 13c; 30a, 31a) are disposed inside the receiving concavity of the pressure member (3; 13, 30).

3. Bearing module according to claim 1 or 2, characterised in that the one or more wedge devices (3c, 13c; 30a, 31a) are disposed or formed with an abutment and/or support on the wall of the pressure member (3; 13, 30) or its receiving concavity respectively.

4. Bearing module according to claim 1, 2 or 3, characterised in that the guide passage (14) is directly limited by one or more separately formed guide pressure parts (3; 30), which are disposed inside the receiving concavity, are supported on the wall thereof, and may be acted on by a radially inwardly oriented force by means of the wedge device(s) (3c, 13c; 30a, 31a) which are adjustable axially or in an axially parallel manner, to which end the one or more wedge devices (3c, 13c; 30a, 31a) are guided, disposed and/or formed between the pressure member (13) and the guide pressure part(s) (3, 30).

5. Bearing module according to one of the preceding claims, characterised in that at least one of the wedge devices (3c, 13c; 30a, 31a) is formed with two complementary slopes (3c, 13c; 30a, 31a) allocated to one another for abutment and being displaceable relative to one another, and belonging to different module components (13, 3; 30, 31) guidable relative to one another.

6. Bearing module according to claims 4 and 5, characterised in that each one of the two slopes of a wedge device (3c, 13c) is formed on the pressure member inner wall and on an opposing wall of the respective guide pressure part (3).

7. Bearing module according to claim 6, characterised by a guide pressure part (3) with a basic shape concentric to the guide passage (14), the said part being provided on its outer casing opposite the pressure member inner wall with the one or more slopes (3c), to which complementary slopes (13c) are respectively allocated on the pressure member inner wall.

8. Bearing module according to claims 6 or 7, characterised by a guide pressure part (3) with a shell-like and/or part-circle-like basic shape, wherein the shell opening or concave part-circle side (3b) faces the guide passage (14).

9. Bearing module according to one of claims 6 to 8, characterised in that the guide pressure part (3) has the one or more slopes (3c) on an end edge or in another end region.

10. Bearing module according to one of claims 6 to 9, characterised in that the one or more slopes (13c) of the pressure member inner wall are

formed by outer complementary indentations (13e) or other recesses in the pressure member outer casing (13h).

11. Bearing module according to one of claims 6 to 10, characterised in that the guide pressure part (3) is guided displaceably via one or more support means, which are formed on the pressure member inner wall or in the rack guide passage (14).

12. Bearing module according to claim 11, characterised in that as a support means plural support shoulders (13g) project from the pressure member inner wall and are disposed preferably diametrically opposite one another, on which the guide pressure part (3) rests displaceably with end faces or edges (3f) via sliding contact.

13. Bearing module according to claims 4 and 5, characterised by at least one separately formed wedge member (31) with two wedge flanks (31a, 31b) extending at an acute angle, one of which (31b) extends or is disposed axially or axially parallel, whilst the other wedge flank (31a) forms one of the two slopes of the wedge device (30a, 31a) and is allocated to its second slope (30a) for abutment, wherein the second slope (30a) extends on an outer face, opposite the wedge member (31), of the guide pressure part (30) in a complementary manner.

14. Bearing module according to claim 13, characterised in that the or at least one of the wedge members (31) is disposed between the concave wall of the pressure member (13) and the only or one of the guide pressure parts (30).

15. Bearing module according to claim 13 or 14, characterised in that in order to secure the wedge member (31) against rotation, this is provided with one or more stops (31c) which project transverse or obliquely to its longitudinal direction or to the axial direction (2) and which is/are

allocated to the pressure member (13) and/or to the guide pressure part (30) for abutment or holding in a circumferential direction concentric to the guide passage (14).

16. Bearing module according to claim 15, characterised in that the holder is formed as a recess, window, perforation (13o) or other cutout in the wall of the pressure member (13) or guide pressure part (30), to which the only or one of the stops (31c) is allocated for engagement.

17. Bearing module according to one of the preceding claims, characterised by an actuator (6) which is arranged for axial or axially parallel displacement of the one or more wedge devices (3c, 13c; 30a, 31a) and which is movably guided and/or lockable or fixable relative to the pressure member.

18. Bearing module according to claim 17, characterised in that the pressure member (13) and the actuator (6) respectively have an annular, cylindrical or other rotationally symmetrical basic shape for concentric arrangement one in another and have complementary thread devices (13f), via which the pressure member (13) and the actuator (6) may be brought into engagement rotatably and displaceably relative to one another.

19. Bearing module according to claim 18, characterised in that the meshing complementary thread devices (13f, 6) are caulked together, cold-formed or otherwise deformed in order to secure against rotation.

20. Bearing module according to one of the preceding claims, characterised by the arrangement of a spring element (5; 50) for biasing a wedge device (3c, 13c; 30a, 31a) in an axial and/or axially parallel direction.

21. Bearing module according to claim 20, characterised in that the respective spring element (5; 50) is supported against the actuator (6) on the one side and against one (3c; 31a) of two oblique elements of a wedge device (3c, 13c; 30a, 31a) which are adjustable relative to one another on the other side.

22. Bearing module according to claim 20 or 21, characterised in that the spring element (50) has an annular or other rotationally symmetrical basic shape optionally with corrugations or other recesses or projections projecting axially parallel from the annular base plane.

23. Bearing module according to claim 22, characterised in that between the annular spring element (50) and the wedge device (30a, 31a) a fixed, substantially plane axial pressure ring (40) is disposed.

24. Bearing module according to either of claims 20 or 21, characterised in that the spring element (5) is disposed in a receiving chamber (3e) and optionally projecting therefrom with one part, wherein the receiving chamber (3e) is structurally incorporated in the only or one of the guide pressure parts (3).

25. Bearing module according to claim 24, characterised in that the spring element (5) has a basic shape complementary to the receiving chamber (3e) and/or elastomer or other resilient material.

26. Bearing module according to one of the preceding claims, characterised in that the outer casing of the pressure member or of a steering stop ring (7) added to the end-face thereof is provided with one or more orientation projections and/or recesses (7c), which are allocated to complementary recesses (1m) or projections on the inner face of a hypothetical steering gear housing (1) and are so positioned in the circumferential direction that upon hypothetical assembly with the rack (9) and the driving pinion

(10) in the steering gear housing (1), the radial forces emitted from the concave wall are oriented to the rack outer face or the rack outer casing section which diametrically oppose, optionally with axial offset, its teeth meshing with the driving pinion (10).

27. Bearing module according to one of the preceding claims, wherein the receiving concavity of the pressure member (3; 13) and optionally of the only or one of the guide pressure part(s) (3; 30) is provided at least in part with a longitudinal side opening (3b, 3f; 13d; 30b) parallel to the axis (2) of the guide passage (14), characterised in that the longitudinal side edges (13i) defining the opening (13d) extend obliquely in a ramp- or wedge-like manner with respect to the axis (2) or a longitudinal plane of the guide passage (14) or of a hypothetical steering gear housing (1).

28. Bearing module according to one of the preceding claims, characterised by plural wedge devices (3c, 13c; 30a, 31a) with an arrangement relative to one another such that their respectively mutually abutting slopes (3c, 13c; 30a, 31a) have normals (13N) which intersect in the centre (2) of the guide passage (14) and/or at an angle (13k) of less than 180°.

29. Bearing module according to one of the preceding claims, characterised by two wedge devices (3c, 13c; 30a, 31a) each with mutually abutting slopes, whose normals (13N) converge towards the centre (2) of the guide passage (14).

30. Motor vehicle steering gear, in which within a gear housing (1) a rack (9) is engaged with a driving pinion (10), having a bearing module according to one of the preceding claims mounted therein, by means of which the rack (9) is pressed against the pinion (10), characterised by an actuator (6) disposed in the bearing module and formed in such a manner that an adjusting tool (11) may be brought into mesh therewith by axial insertion in the housing (1) in order to actuate the actuator (6), the actuator (11)

being in active connection with the wedge device(s) (1e, 3c; 3c, 13c; 30a, 31a) for axial or axially parallel displacement thereof.

31. Steering gear according to claim 30, having a bearing module according to claim 27, characterised in that inside the housing (1) support edges, shoulders or other abutments are formed, which are allocated to the oblique open longitudinal sides (13i) of the receiving concavity, in order following its axial insertion (4) to bend or wedge and hence position fixedly the bearing module in the housing.

32. Steering gear according to claim 31, wherein the gear housing (1) has for the driving pinion (10) a pinion tubular part (1b) which extends obliquely or transverse to the main longitudinal axis, characterised in that the pinion tubular part (1b) is formed with edges (1g) projecting into the interior of the housing (1), with which the bearing module may be wedged with its oblique longitudinal side edges (13i).

33. Motor-vehicle steering gear, in which within a gear housing (1) a rack (9) is in engagement with a driving pinion (10), and having at least one pressure member (3) with a receiving concavity, whose concave wall surrounds a guide passage (14) for axial guiding of the rack (9), wherein radial forces emitted from the wall may be generated by means of at least one translationally displaceable wedge device (1e, 3c; 3c, 13c; 30a, 31a) for pressing the rack (9) received in the guide passage (14) on to the driving pinion (10) engaging therein, characterised in that for generating radial force the one or more wedge devices (1e, 3c; 3c, 13c; 30a, 31a) are displaceably guided in a direction which extends axially or axially parallel to the guide passage (14) for the rack (9) and/or to the housing longitudinal axis (2).

34. Steering gear according to claim 33, characterised by a pressure member (3) with shell-like and/or partially cylindrical basic shape,

wherein the shell opening (3b) or concave open partial cylinder face (3b) faces the guide passage (14).

35. Steering gear according to claim 33 or 34, wherein at least one of the wedge devices (1e, 3c; 3c, 13c; 30a, 31a) is formed with two complementary slopes which are allocated to one another for abutment and which are displaceable relative to one another, characterised in that the one slope (3c) is formed on an outer face or outer casing of the pressure member (3) and the other slope is formed on an opposing inner face or opposing inner casing of the housing (1).

36. Steering gear according to claim 35, characterised in that the pressure member (3) has one or more slopes (3c) on an end edge or in another end region.

37. Steering gear according to one of the preceding claims, characterised in that the pressure member (3) is displaceably guided on one or more support means (8) which project from the housing inner wall.

38. Steering gear according to claim 37, characterised in that the one or more support means (8) are formed by respective pins, which penetrate the housing wall from the outside.

39. Steering gear according to one of the preceding claims, having a bearing module according to claim 26, characterised in that the housing inner wall has preferably in the end-face end region one or more recesses or projections (1m) complementary to the one or more orientation projections and/or recesses (7c) of the pressure member outer casing or of a steering stop ring (7) connected to the end-face thereof with a positioning in the circumferential direction such that in the case of orientation projections or recesses (1m, 7c) interlocking on both sides the pressure forces emitted form the concave wall are oriented on to the rack

outer face or rack outer casing section which diametrically opposes the teeth of the rack (9) meshing with the driving pinion (10).

40. Steering gear according to one of the preceding claims, characterised by an actuator (6) which is provided for axial or axially parallel displacement of the one or more wedge devices (1e, 3c; 3c, 13c; 30a, 31a) and which is movably guided relative to the gear housing (1).

41. Steering gear according to claim 40, characterised in that the housing (1) and the actuator (6) respectively have an annular, cylindrical or otherwise rotationally symmetrical basic shape for concentric arrangement one in another and have complementary thread devices (1f), via which the housing (1) and the actuator (6) may be brought into engagement rotatably and displaceably relative to one another.

42. Steering gear according to claim 41, characterised in that the meshing complementary thread devices (6, 1f) are caulked together, cold-formed or otherwise deformed to secure against rotation.

43. Steering gear according to one of claims 40 to 42, characterised in that one or more spring elements (5; 50) is/are interposed between the actuator (6) and the wedge device (1e, 3c; 3c, 13c; 30a, 31a) in order to bias the same in the axial or axially parallel direction.

44. Steering gear according to claim 43, wherein at least one of the wedge devices (1e, 3c; 3c, 13c; 30a, 31a) is formed with two complementary slopes allocated to one another for abutment and displaceable relative to one another, characterised in that the respective spring element (5; 50) is supported against the actuator (6) on the one side and against one of the two mutually relatively displaceable oblique elements of the wedge device (1e, 3c; 3c, 13c; 30a, 31a) on the other side.

45. Steering gear according to one of the preceding claims, characterised by a locking device fixing the bearing module and/or the pressure member (3; 13) and/or the actuator (6) in the gear housing (1) in the axial or axially parallel direction (2, 4).

46. Steering gear according to claim 45, characterised in that the locking device is formed with a stop block (7) axially inserted in the gear housing and with a radial bead indentation (1l) or other deformation in the housing wall for engaging behind the stop block (7).

47. Steering gear according to one of the preceding claims, characterised by plural wedge devices (1e, 3c; 3c, 13c; 30a, 31a) with an arrangement relative to one another such that their respectively abutting slopes (3c, 13c) have normals (13N) which intersect at the centre (2) of the guide passage (14) and/or at an angle (13k) of less than 180°.

48. Steering gear according to one of the preceding claims, characterised by two wedge devices (1e, 3c; 3c, 13c; 30a, 31a), each with mutually abutting slopes (3c, 13c) whose normals (13N) converge towards the centre (2) of the guide passage (14).

49. Pressure shell (3) as a guide pressure part for a bearing module according to one of claims 4 to 18 or as a pressure member for a steering gear according to one of claims 35 to 48, characterised by a casing section which is guided over a partial circle, is partially cylindrical or otherwise curved or arched, having a convex outer face (3a) and a concave inner face or open side (3b), wherein at least one (3a) of the sides has one or more slide and abutment faces (3c), which extend obliquely in a ramp-like manner to a cylinder longitudinal axis (2) or to a longitudinal direction of the concave open side.

50. Pressure shell according to claim 49, characterised in that on an end face remote from the oblique faces at least one receiving chamber (3e) is formed, which extends into the shell wall.

51. Pressure shell according to claim 50, characterised in that in the receiving chamber (3e) an elastomer or other resilient impact body (5) is received, preferably partially projecting.

52. Pressure shell according to one of the preceding claims, characterised by plural oblique slide and abutment faces (3c) with an arrangement relative to one another such that their respective normals (13N) intersect at an angle of less than 180°.

53. Pressure shell according to one of the preceding claims, characterised by two oblique slide and abutment faces (13c), whose normals (13N) extend convergently.

54. Housing for a steering gear according to one of claims 33 to 38, characterised by one or more slopes (1e) formed on the housing inner face, which are disposed for pressing on the meshing region between the driving pinion (10) and the rack (9) and which rise or fall relative to an axially parallel direction (2, 4).

55. Housing according to claim 54, characterised in that the one or more slopes of the concave housing inner wall are formed by external complementary indentations (1e) or other recesses in the housing outer casing.

56. Housing according to one of the preceding claims, characterised in that the plural slopes are so arranged relative to one another that their respective normals intersect in the centre (2) of a guide passage (14) for the rack (9) and/or at an angle of less than 180°.

57. Housing according to one of the preceding claims, characterised by two slopes (1e), whose normals converge towards the centre (2) of the guide passage (14).